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㉚ Apparatus for cutting a web at a predetermined length and supplying the same.

㉛ A cutting roller (31) having cutting blades (33) and a receiving roller (32) are provided downstream of pulling-out rollers (21) for pulling out a web (2), and the web passing between them is cut. Accelerating rollers (51) rotated at a transmitting speed higher than that of the pulling-out rollers (21) apply a tension to the web. The cutting blades (33) are formed with narrow cutouts (35), and the receiving roller (32) is provided with narrow annular grooves (37). Stretched tension guide members (12) extend through the notches (35) and the narrow annular grooves (37) so as to guide the web. The portions of the web corresponding to the notches (35) and the narrow annular grooves (37) are not cut by the cutting blades (33) and are left as uncut portions. However, these portions are broken easily by the tension applied to the web (2). Since the widths of the cutouts (35) and the annular grooves (37) are very narrow, the torn marks on the broken portions of the web are not remarkable. As the tension guide members (12) extend continuously, the cut end of the web is not caught and are not rolled on the cutting roller (31).

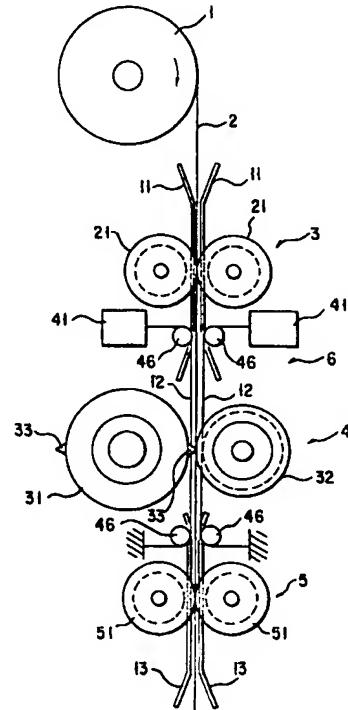


FIG. 1

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The present invention relates to an apparatus for cutting a web at a predetermined length and supplying the same to the following processing apparatus, and more particularly to an apparatus for cutting a continuously supplied web-like packing material in a packing process at a predetermined length and supplying the same to a packing machine.

In general, a packing material used for packing cigarettes has an elongated web-like shape and is wound into a web roll. In the cigarette packing process, the web is continuously pulled out and cut at a length corresponding to the length of a pack, and the cut web piece is supplied to a packing apparatus or the like in the next process.

One of the conventional apparatuses for cutting a web-like material at a predetermined length and supplying the same to the apparatus in the next process cuts off web pieces from the web at the predetermined to-be-cut portions at predetermined intervals. The web on this apparatus has cutouts extending crosswise of the web. Each cutout comprises alternating discontinuous broken line portions and unbroken portions which connect adjacent web portions together so that the web can be continuously pulled out although it has the cutouts. After having pulled out, each web portion is moved between two pairs of rollers arranged in tandem in its moving direction. The transporting speeds of the paired rollers differ from each other. The downstream side pair of rollers rotate at a higher speed than the upstream side pair rollers. Thus, each web portion is applied with a predetermined tension while it moves between these pairs of rollers. The unbroken portions of the cutout are cut off by the tension and the web is cut at the predetermined length at the portion to be cut. The cut-out web portion is supplied to the packing apparatus or the like.

Although this conventional cutting and supplying apparatus has a simple structure, it has the following disadvantage. When a web is made of cellophane or the like, the web is torn away substantially linearly at the unbroken portions at the cutouts and the cut-out portions are smooth. When, however, a web is made of paper or the like, the unbroken portions at the cutouts are not cut linearly but torn irregularly and/or become fluffy. The irregular and/or fluffy cut edges sometimes cause poor operation such as clogging of the web portion in the next process and deteriorates the appearance of a package.

These problems can be prevented by shortening the unbroken portions at each cutout. Since, however, the strength of the unbroken portions of the cutouts is lowered, the unbroken portions of the cutouts are torn away when such tearing-away is not required.

An apparatus housing a cutting mechanism is provided for preventing such trouble. When processed on this apparatus, a web is not formed with cutouts. The cutting mechanism comprises a pair of cutting rollers which rotates at a peripheral speed equal to or slightly larger than the transporting speed of the web and between which the web passes. A plurality of cutting blades are provided on each cutting roller at predetermined circumferential intervals. The cutting blades are pressed against the web and cut out the web in the predetermined direction.

With this apparatus, every kind of web material can be cut regularly and no irregular cut end is formed. Further, the web material is not cut at a portion not required to be cut upon being pulled out.

This apparatus requires a guide for guiding the web material which is being transported. Naturally, the guide cannot be formed which can pass the cutting rollers continuously. If the guide passed the cutting rollers continuously, the cutting blades of the cutting rollers would not only hit against the guide and be unable to cut the web material but also be broken.

In the conventional apparatus, the guide is formed by an upstream guide element and a downstream guide element which are arranged adjacent to each other so as not to interfere with the cutting rollers. These two guide elements substantially form a continuous guide member.

In this arrangement, however, the guide is discontinuous at the portion where the web material is pressed and cut by the cutting rollers. When the cutting blades cut the web material, the cut end of the web material sometimes adheres to the cutting blades. In this case, the cut end of the web material is moved in the peripheral direction of either one of the cutting rollers and is held in the discontinuous space of the guide. Then, clogging of the cut web material sometimes occurs. In some cases, the cut end of the web material is rolled on either one of the cutting rollers in a state in which the cut end adheres to the cutting blades.

The present invention was made under this situation, and the object thereof is to provide a web cutting and supplying apparatus in which a completely continuous web without to-be-cut portions is continuously pulled out from a web roll and cut at a predetermined length and in which clogging of web pieces occurring when their cut ends are caught by a guide and rolling of the web pieces on a cutting roller are fully prevented.

In order to achieve the object, a web cutting and supplying apparatus according to the present invention comprises pulling-out means, cutting means, accelerating mean and guide means.

The pulling-out means included a pair of pulling-out rollers which sandwiches a web pulled out from a web roll and pulls out the web at a predetermined speed. The cutting means is provided downstream of the pulling-out means in view of the transferring direction of the web and comprises a cutting roller and a receiving roller provided and disposed close to the cutting roller. Both rollers are rotated in the opposite directions. The cutting roller is provided on its peripheral surface with projecting cutting blades arranged at predetermined intervals circumferentially and extending axially of the cutting roller. The cutting blades are pressed against the peripheral surface of the receiving roller so as to cut the portion of the web which has passed between the cutting and receiving rollers at a predetermined length. At the downstream side of the cutting means is provided accelerating means which has a pair of accelerating rollers sandwiching the web and sending the same in the transporting direction at a speed slightly larger than the speed which the cutting means provides.

The guide means abuts against both surfaces of the web which has passed through the pulling-out means, cutting means and accelerating means and guides the thus passed web. The guide means has tension guide members each having a small diameter and extending continuously between the cutting roller and the receiving roller of the cutting means in the transmitting direction of the web. Each tension guide member is stretched by a predetermined tension. Each cutting blade is formed with notches for preventing interference of the cutting blade with the tension guide members. Each tension guide member passes through the corresponding notch and is stretched under a predetermined tension. In the peripheral surface of the receiving roller are formed narrow annular grooves for preventing interference of the receiving roller with the tension guide members. The tension guide members pass through the corresponding narrow annular grooves and are stretched under a predetermined tension.

The web pulled out from the web roll is transported at a predetermined speed by means of the pulling-out means. Since the web is cut off by the corresponding cutting blade, the web is ensured to be cut accurately irrespective of the kind of material or the like. Because the tension guide member extends continuously in the transferring direction of the web, the cut end of the web is not caught by the cutting blade and is not rolled on the cutting roller even when the cut end portion adheres to the tip of the cutting blade.

The cutouts and the narrow annular grooves are formed in the cutting blade and the receiving roller. Thus, the web would be not cut at them and uncut portions would be left there. Since, however,

the widths of the cutouts and of the narrow annular grooves can be made narrow enough because the tension guide members are very thin, the uncut portions of the web are also very narrow. In addition, the web is applied with tension by the accelerating means disposed downstream of the cutting means. Thus, the portions which have been uncut are torn easily and the web is cut at the predetermined length. Because of their narrow structure, the torn portions are smooth and are prevented from being formed irregularly, thereby being protected from being caught in the next process and/or deteriorating their appearance.

This invention can be more fully understood from the following detailed description when taken in conjunction with the accompanying drawings, in which:

- 20 FIG. 1 is a general side view of the overall apparatus of an embodiment according to the present invention;
- 25 FIG. 2 is a perspective view of a pulling-out roller and parts of guide rod members;
- 30 FIG. 3 is a perspective view of a cutting roller and parts of tension guide members;
- 35 FIG. 4 is a perspective view of a receiving roller and parts of the tension guide members; and
- 40 FIG. 5 is a cross sectional view of the main part of a tension adjusting mechanism.

An embodiment according to the present invention will be described with reference to the accompanying drawings.

The embodied apparatus is used for cutting a web for wrapping cigarettes at a predetermined length and supplying the cut web pieces to an apparatus in the next process such as a wrapping machine. A general structure of the apparatus will be described with reference to FIG. 1.

With this apparatus, a web 2 is pulled out from a web roll 1 formed by winding the web 2 itself and is supplied to the apparatus in the next process. The web 2 is made of continuous material without to-be-cut portions. The pulled-out portion of the web 2 is transported at a predetermined speed toward the downstream side by means of cutting means comprising a roller mechanism 3. Cutting roller means comprising a cutting roller mechanism 4 for cutting the transported portion of the web 2 at the predetermined length is provided downstream of the pulling-out roller mechanism 3 (i.e., at the downstream side in view of the transporting direction of the pulled-out web portion). Downstream of the cutting roller mechanism 4 is disposed accelerating means comprising an accelerating mechanism 5 for transporting pulled-out portion of the web 2 at a speed higher than that provided by the pulling-out roller mechanism 3. Guiding means comprising a guide mechanism 6 guides the portion of the web 2 transported through the pulling-

cut mechanism 3, the cutting roller mechanism 4 and the accelerating roller mechanism 5, and comprises first guide rod members 11, tension guide members 12 made of music wires or the like and second guide rod members 13.

Each mechanism will described. The pulling-out roller mechanism 3 comprises a pair of pulling-out rollers 21 which have peripheral surfaces contacting each other under a predetermined pressure and are rotated around their shaft 22 in the opposite directions at the same peripheral speed. The portion of the web 2 pulled out from the roll 1 is held between the pulling-out rollers 21 and sent downstream at a predetermined speed.

The first guide rod members 11 of the guide mechanism 6 extend in the downstream direction through the pulling-out roller mechanism 3. The first guide rod members 11 extend along the upper surface and the under-surface of the transported portion of the web 2 so that the transported portion of the web 2 is transported on the predetermined path. As shown in FIG. 2, each first guide rod member 11 is an elongated rigid rod.

Referring to FIG. 2, annular grooves 23 for preventing interference of the pulling-out roller 23 with the respective first rod members 11 are formed in the peripheral surface of each pulling-off roller 21. The first guide rod members 11 extend continuously through the grooves 23 from the upstream side to the downstream side of the pulling-out rollers 21.

The cutting roller mechanism 4 has a cutting roller 31 and a receiving roller 32 which are disposed at their peripheral surfaces close to each other and are rotated around their shafts 34 in the opposite directions at the same peripheral speed.

On the peripheral surface of the cutting roller 31 are projectingly provided cutting blades 33 which are arranged circumferentially and extend axially of the cutting roller 31 i.e., crosswise thereof at predetermined intervals. As the cutting roller 31 and the receiving roller 32 are rotated, the cutting blades 33 are pressed against the peripheral surface of the receiving roller 32 and the portion of the web 2 which is passing between the cutting roller 31 and the receiving roller 32 is cut at a predetermined length by the cutting blades 33.

The guide mechanism 6 has the tension guide members 12 disposed at the cutting mechanism 4. The tension guide members 12 are arranged along the front surface and the rear surface of the transported portion of the web 2 similar to the first guide rod members 11. Each tension guide member 12 is made of a thin music wire having a very small diameter, a thin metal strip, an element having a small diameter or thickness and made of material having a high tensile strength, or the like.

One end (the lower end, for example) of each tension guide member 12 is fixed to the fixed side of the apparatus. The other end (the upper end, for example) of the member 12 is connected to a tension control structure 41 and the member 12 is applied with a predetermined tension. Although the tension guide member 12 has a small diameter and is not rigid, it is stretched linearly by the tension so that it functions as a guide member.

The tension guide members 12 continuously extend through the cutting roller mechanism 4 from the upstream side to the downstream side of thereof. As shown in FIG. 3, notches 35 for preventing the respective cutting blade 33 from interfering with the tension guide members 12 are formed in each cutting blade 33. The tension guide members 12 continuously extend vertically through the notches 35.

As shown in FIG. 4, narrow annular grooves 37 for preventing interference of the receiving roller 32 with the tension guide members 12 are formed in the peripheral surface of the receiving roller 32. The tension guide members 12 continuously extend vertically through the narrow annular grooves 37.

In FIG. 5 is shown an example of the tension control structure 41 having an L-shaped fixture 43 fixed to a member of the fixed side of the apparatus such a frame. A bolt 44 is screwed to the L-shaped fixture 43 so as to extend therethrough. A nut 45 threadably engages with the bolt 44. Each tension guide member 12 is guided by a pair of guide rollers 46. The tension guide member 12 has one end connected to one end of the bolt 44 and the other connected to the fixed side of the apparatus. The bolt 44 is moved with respect to the fixture 43 by rotating the nut 45 so that the tension guide member 12 is pulled and is provided with predetermined tension. Further, the rotation of the nut 45 adjusts the tension applied to the tension guide member 12.

The accelerating roller mechanism 5 has a pair of accelerating rollers 51. Similarly to the first guide rod members 11, the second guide rod members 13 continuously extend vertically through the accelerating mechanism 5 from the upstream side to the downstream side thereof. Annular grooves are formed in the peripheral surface of each accelerating roller 51. The second guide rod members 13 continuously extend vertically through the annular grooves. Since the accelerating roller mechanism 5 has the same structure to the pulling-out roller structure 3, no further detailed description is made.

Alternatively, the tension guide members 12 can extend over the whole area from the upstream side of the pulling-out roller mechanism 3 to the downstream side of the accelerating roller mechanism 5. In this arrangement, the guide rod mem-

bers 11 and 13 are not required, simplifying the structure of the apparatus, if the following disadvantage is not considered. When the tension guide members 12 are too long, however, their central portions tend to oscillate in resonance with the oscillation of the apparatus. In such an occasion, the central portions of the tension guide members 12 are apt to contact the inner surfaces of the notches of the cutting edges 33 and/or the inner surfaces of the narrow annular grooves 37 of the receiving roller 32, resulting in wear and/or breakage of the tension guide members 12.

In order to prevent this disadvantage, this embodiment employs guide rod members 11 and 13 which have large diameters and are made rigid. The tension guide members 12 cover the minimum region between the upstream side and the downstream side of the cutting roller mechanism 4.

It follows in this arrangement that the tension guide members 12 are shortened so as not to be oscillated by the oscillation of the apparatus. The pulling-out roller mechanism 3 feeds the web 2 by merely holding it and the accelerating roller mechanism 5 accelerates the transporting speed of the web 2 also merely holding the web 2. In spite of the fact, therefore, that the guide rod members 11 and 13 each having a large diameter pass the mechanisms 3 and 5, the function of the mechanisms 3 and 5 is not deteriorated.

With the accelerating mechanism 5, transported portion of the web 2 is held between the accelerating rollers 51 and sent downward at a transporting speed higher than that provided by the pulling-out roller mechanism 3. The difference between the two transporting speeds produces a predetermined tension.

The operation of the apparatus according to the present invention will be described. The web 2 is continuously pulled out from the web roll 1 by means of the pulling-out roller mechanism 3 and transported at a predetermined speed. The pulled-out portion of the web 2 is cut at a predetermined length by the cutting roller mechanism 4.

The portions of the web 2 corresponding to the cutouts 35 of the cutting blades 33 and the narrow annular grooves 37 of the receiving roller 32 are not cut by the cutting blades 33 of the cutting roller 31 but are left as uncut portions. However, the uncut portions of the web 2 are torn as soon as they are formed by the tension produced between the difference of the transporting speeds of the pulling-out roller mechanism 3 and the accelerating roller mechanism 5. Thus, the web 2 is completely cut.

Torn marks are left at the portions of the web 2 which have been torn. However, the notches 35 and the narrow annular grooves 37 have very small widths corresponding to the small diameter of the

tension guide members 12, and the length of each uncut portion of the web 2 is very small. Thus, even if the web 2 is made of paper, the torn marks are not so remarkable as deteriorates the appearance of the cigarette package. Further, portions of the web 2 where the torn marks exist are not caught by any elements in the following processes. In this connection, the web 2 is ensured to be cut accurately irrespective of the kind of material of which the web 2 is made.

The tension guide members 12 continuously extends vertically through the cutting roller mechanism 4. Even if the cut end of the web happens to adhere to the cutting blades 33 and be swung laterally, the cut end is not held in the discontinued portions of the guide members as is in the conventional case, and the web 2 is securely guided. The secure guide of the web 2 also prevents cut end portion of the web 2 from being rolled on the cutting roller 31 in a state in which the cut end adheres to the cutting blades 33.

The present invention is not limited to an apparatus for cutting and supply of packing material of cigarettes but is applicable to a general apparatus for cutting a web at a predetermined length and supplying the same to the next process.

Claims

- 30 1. An apparatus for pulling out a web from a web roll, cutting said web at a predetermined length and supplying said web, said apparatus comprising:
 - 35 (a) pulling-out means (3) comprising at least one pair of pulling-out rollers (21) rotated in opposite directions at predetermined transmitting speed, for holding therebetween a web (2) portion pulled out from a web roll and transporting said web portion in a transporting direction;
 - 40 (b) cutting means (4) comprising:
 - 45 a cutting roller (31) and a receiving roller (32) disposed close to each other, as a pair, downstream of said pulling-out roller (21), said cutting roller (31) having a peripheral surface and said receiving roller having a peripheral surface; and
 - 50 axially extending cutting blades (33) provided on said peripheral surface of said cutting roller (31), for pressing said peripheral surface of said receiving roller (32) and cutting said web (2) portion passing between said cutting roller (31) and said receiving roller (32) at a predetermined length into a web piece having two surfaces;
 - 55 (c) accelerating means (5) comprising at least one pair of accelerating rollers (51) provided downstream of said cutting means

(4) and rotated at a transporting speed higher than said transporting speed of said pulling-out rollers (21), for sandwiching and transporting said web piece in said transporting direction;

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(d) guide means (6) comprising a plurality of tension guide members (12) having a small diameter and continuously extending straight under a predetermined tension from an upstream side to a downstream side of said guide means along said both surfaces of said web piece which has passed through said pulling-out means (3), said cutting means (4) and said accelerating means (5), for guiding said web piece in a state in which said tension guide members (12) contact with said both surfaces of said web piece;

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(e) each of said cutting blades (33) of said cutting rollers (31) of said cutting means (4) being formed with notches (35) through which said tension guide members (12) at a side of one of said surfaces of said web piece pass, for preventing said cutting blade (33) from interfering with said tension guide members (12); and

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(f) said receiving roller (32) being provided in said peripheral surface thereof with narrow annular grooves (37) through which said tension members (12) at a side of the other surface of said web piece pass, for preventing said receiving roller (32) from interfering with said tension guide members (12).

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2. An apparatus according to claim 1, characterized in that said guide means (6) comprises said tension guide members (12) and guide rod members (11, 13) each having a large diameter and being made rigid, said guide rod members (11, 13) passing through said pulling-out means (3) and said accelerating means (5), said tension guide members (12) passing merely through said cutting means (5) so as to be shortened.

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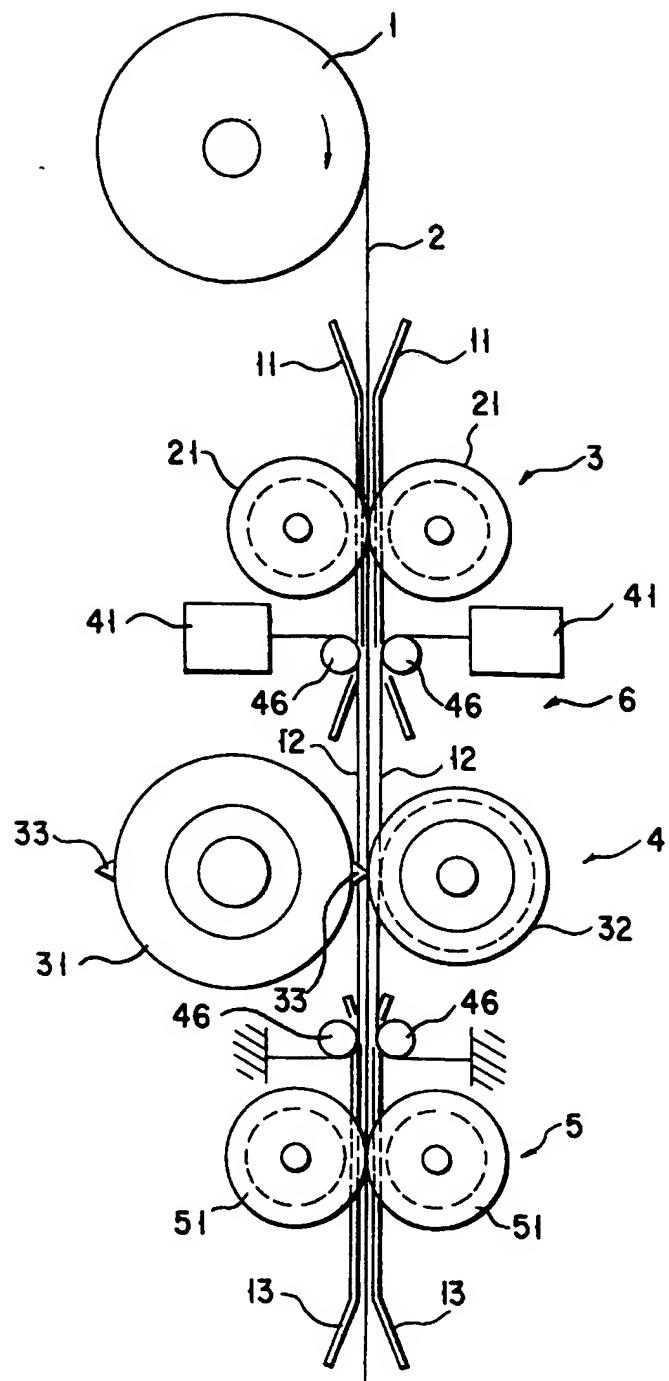
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3. An apparatus according to claim 1, characterized in that each of said tension guide members (12) comprises a music wire.

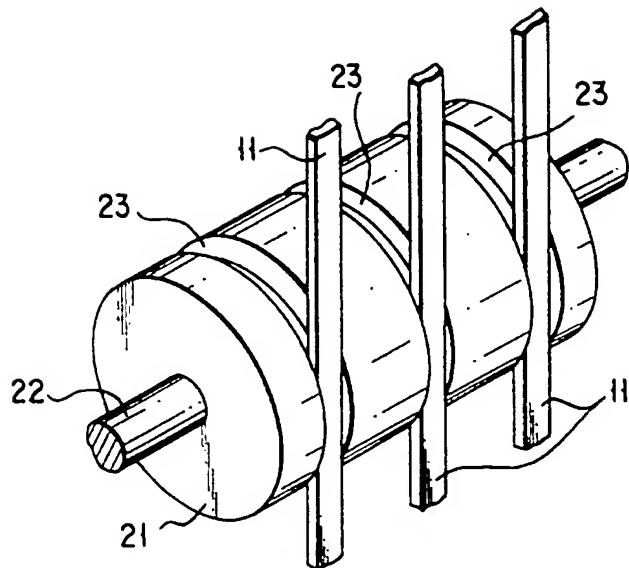
4. An apparatus according to claim 1, further comprising a tension control mechanism (41) for applying a predetermined tension to said tension guide members (12) and adjusting a tension applied to said tension guide members (12).

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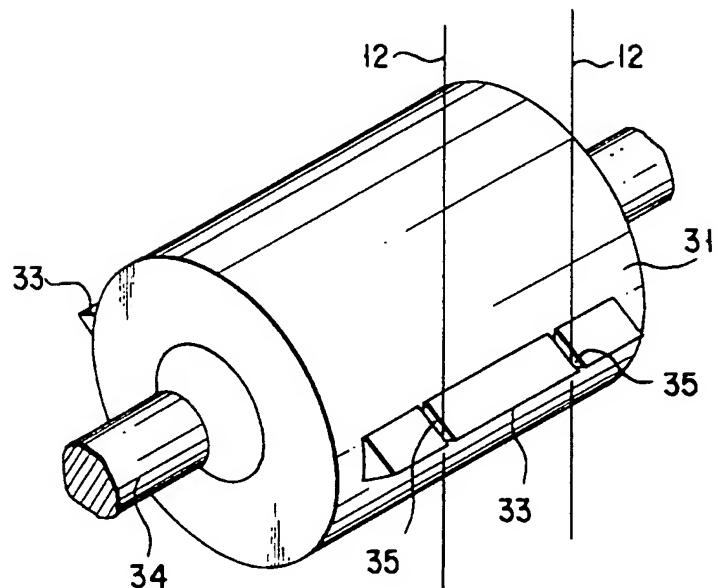
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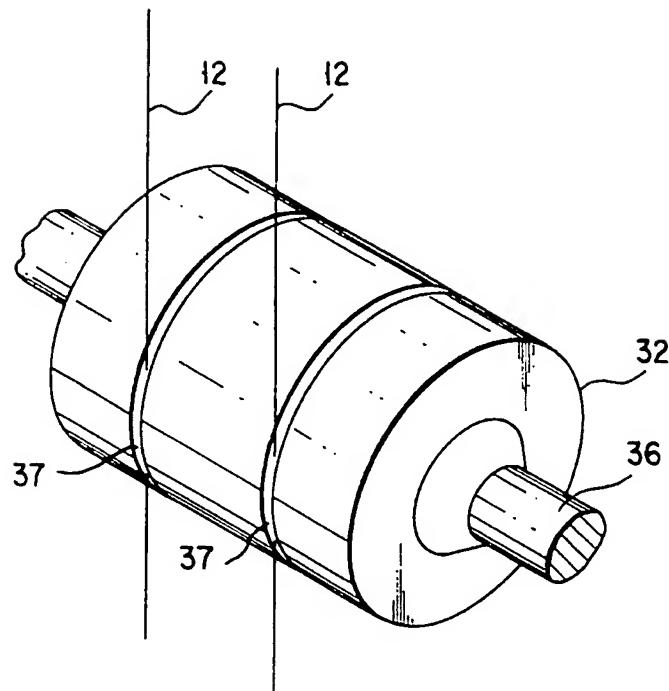
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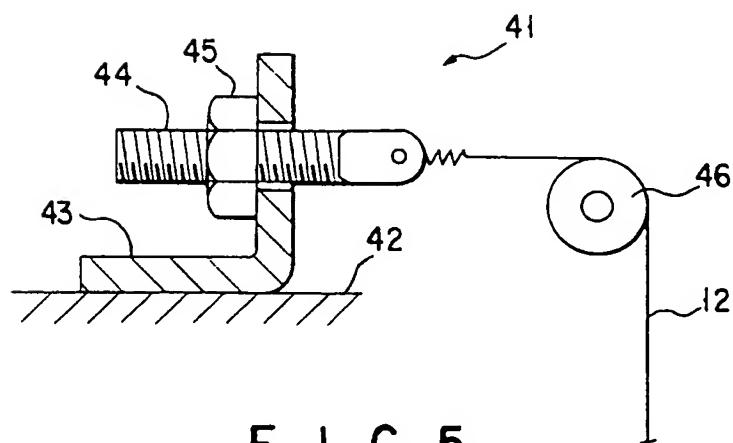
F | G. 2



F | G. 3



F I G. 4



F I G. 5



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EUROPEAN SEARCH REPORT

Application Number
EP 94 10 5042

DOCUMENTS CONSIDERED TO BE RELEVANT		Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.CLS)
Category	Citation of document with indication, where appropriate, of relevant passages		
Y	GB-A-M23859 (CUMMING) 18 April 1913 * the whole document * ---	1	B65H35/08 B65H35/10
Y	US-A-4 118 022 (RAYFIELD ET A.) * column 9, line 52 - column 10, line 10; figures 1,5-7 * ---	1	
A	US-A-5 076 555 (BUNCH) * column 3; figures 1-3 * ---		
A	US-A-4 131 272 (HARTNIG) * column 3, line 65 - column 4, line 7; figures 1,2 * ---		
A	EP-A-0 338 260 (STOBB INC.) * column 5, line 14 - line 25; figures 2,3 * ---		
A	GB-A-2 256 828 (MAN ROLAND DRUCKMASCHINEN AG.) * figures 1,2 * ---		
A	DE-A-39 00 663 (MITSUBISHI JUKOGYO K.K.) * column 4; figures 1,2 * ---		
A	NL-A-7 211 898 (INDUSTRIËLE ONDERNEMING WAVIN) ---		
A	DE-A-19 35 909 (SCHEMERMUND) -----		
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	15 July 1994	DIAZ-MAROTO, V	
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